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RESEARCH REPORT

THE TRANSFER OF HABITUATION TO ROTATION WITH RESPECT TO THE MAGNITUDE OF THE VESTIBULAR STIMULUS

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U. S. NAVAL SCHOOL OF AVIATION MEDICINE
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THE TRANSFER OF HABITUATION TO ROTATION WITH RESPECT TO THE MAGNITUDE OF THE VESTIBULAR STIMULUS

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SUMMARY

This experiment is a study of the transfer of habituation with regard to the magnitude of the vestibular stimulus. Twenty human subjects received tests of the duration of the oculogyral illusion under two angular velocities before and after a series of 39 rotation trials in which an intermediate angular velocity was employed. The following inferences were made from the results: (1) Habituation is not specific to the 'practiced' angular velocity. (2) Habituation to a given intermediate stimulus will produce greater response reduction to stimuli of lesser magnitude and lesser response reduction to stimuli of greater magnitude than is obtained with the intermediate stimulus. This means that although the responses are reduced by the habituation series, the responses are indicative of a greater sensitivity to differences in vestibular stimuli after than before the habituation series. (3) Comparisons of the results prior to the habituation series have implications for theories of the vestibular end-organ which are discussed briefly. (4) Comparison of the rotational and postrotational results suggests that visual stimulation such as that produced by full room illumination has an habituatory effect which does not generalize to vestibular stimuli with opposite directional components.

INTRODUCTION

The vestibular stimulus has three aspects, magnitude, duration and direction. The vestibular response also has magnitude, duration and direction. The present report is concerned chiefly with the magnitude of the stimulus and its relation to the duration of the response before and after habituation to rotation.

Maxwell, Burke & Reston (11) reported that when postrotational nystagmus had been reduced by repeated rotations at a given rotation rate, a vigorous postrotational nystagmus could be obtained by using a more rapid rotation rate. Griffith (7) noted when nystagmus was completely habituated that changing the rotation speed at any time produced a reappearance of nystagmus, but never in its original intensity.

These experiments by Maxwell _et al_. and Griffith on rabbits and rats respectively are the only bits of empirical evidence known to the writer which are directly related to the question of transfer of habituation from one rotation rate to another. Since neither of these studies were specifically designed to investigate this question, they provide very limited information as to the extent and conditions of transfer. Whether or not there is more transfer of habituation from a given rotation rate to lesser rotation rates than to greater rotation rates is not indicated in these studies.

Basic to any investigation of the transfer of vestibular habituation from one rotation rate to another, is the consideration of the rotatory vestibular stimulus. Many writers (3, 9, 12) have emphasized that positive or negative angular acceleration, and not angular velocity, are the efficient stimulus conditions for activating the vestibular mechanism.

Because there are reports in the literature (4, 10) which indicate that the vestibular response varies as a function of angular velocity, it is important to note that attaining angular velocities of different magnitudes from a resting state (or accomplishing a stop from different magnitudes of angular velocity) necessitates the use of either a different magnitude of angular acceleration or a different duration of angular acceleration or both. It has been recognized for sometime (1, 2) that these two aspects of the strength of the rotatory vestibular stimulus are important. In this connection Dunlap and Dorcus (5) employed three different negative angular accelerations in accomplishing stops from a particular angular velocity and found an inverse relationship between retardation rate and duration of postrotational nystagmus. From this it appears that the influence of stimulus duration is particularly important to the duration of the response, since stimuli of lesser magnitude applied for longer periods of time produced longer responses than greater stimulus magnitudes applied for shorter times.

The present experiment is designed to answer the following question: Where the magnitudes of angular accelerations are approximately constant, does habituation to a given angular velocity transfer equally to two different angular velocities, one which is lesser and one which is greater than the 'practiced' angular velocity? In this case the 'strength' of the vestibular stimulus will be varied by means of changes in the duration rather than the magnitude of the angular acceleration.

The general plan of this experiment is to compare the results of test trials at angular velocities of 10 and 22 rpm before and after a long series of trials at 16 rpm. The duration of the first effects of the oculogyral illusion (OGI) will be used as an indicant of the duration of the vestibular reaction (cf. Graybiel and Hupp, 6), and systematic decrement in the duration of these effects will be referred to as habituation to rotation.

The present experiment is an adjunct to one previously reported (8) in that the long series of trials at 16 rpm were administered as a part of this other experiment, which means, of course, that the Ss were the same in the two experiments. Because the other experiment was primarily concerned with the distribution of practice, the present experiment includes, as a by-product, a group receiving a 'massed' habituation series and another receiving a 'distributed' habituation series.

PROCEDURE

The apparatus, which has been reported in detail elsewhere (8), consisted of a Link trainer modified to rotate solely about its vertical axis. S was seated in the trainer, and was instructed to observe a faint tridimensional target rigidly secured to the trainer directly in front of him. S indicated cessation of rotational and postrotational OGI first effects by pressing a key which caused a light to flash directly over a Standard Electric Timer in an adjoining control room. E recorded the time elapsed from the onset of acceleration until the light flashed

(rotational first effect) and also from the onset of deceleration until the light flashed the second time (postrotational first effect).

The following conditions were utilized in this experiment:

Condition A. S was rotated in a clockwise direction for 61.5 sec. with controls set to achieve an angular velocity of 16 rpm. This yielded 55 sec. of rotation at 16 rpm since about 6.5 sec. elapsed during the positive and negative acceleration periods, which lasted respectively 5.0 sec. and 1.5 sec. Thus the average positive angular acceleration was $19.2^{\circ}/\text{sec.}^2$ and the average negative angular acceleration was $64.0^{\circ}/\text{sec.}^2$. S observed the tridimensional target during and after rotation. Twenty seconds after S had reported cessation of the first postrotational effect, overhead illumination of the room was introduced to reduce dark adaptation. Otherwise and except for the faint light from the target, which was insufficient to make the walls visible, the experimental room was in darkness throughout Condition A.

Condition B. This situation was the same as Condition A except that the experimental room was illuminated by an overhead light for a 5.0 sec. period which commenced 2.0 sec. after the cessation of rotation. The target was observed by S throughout the experimental period (i.e., before, during, and after the 5.0 sec. illumination period). The overhead light was not in the visual range of the subject and imparted an illumination of 1.04 apparent foot candles to wallls of the room. The pleated fabric on the walls provided a background for the target of faint, one inch, vertical stripes.

Condition C. S received clockwise rotation for 61 sec. with controls set to achieve 10 rpm. This yielded approximately 56 sec. of rotation at 10 rpm since 3.0 sec. and 1.0 sec. elapsed during the positive and negative acceleration periods respectively. The average positive and negative angular accelerations were respectively $20^{\circ}/\text{sec.}^2$ and $60^{\circ}/\text{sec.}^2$. In all other respects, Condition C was the same as Condition A.

Condition D. S received clockwise rotation for 62.3 sec. with controls set to achieve 22 rpm. Since about 6.5 sec. and 2.3 sec elapsed during the positive and negative acceleration periods respectively, the desired angular velocity was maintained for approximately 51 sec. The average positive and negative angular accelerations were $20.3^{\circ}/\text{sec.}^2$ and $57.4^{\circ}/\text{sec.}^2$ respectively. In all other respects, Condition D was the same as Condition A.

Twenty men, 17 to 23 years of age, who were stationed at the U. S. Naval Air Station, Pensacola, Florida, served as subjects. These subjects were divided into two equal groups and were subjected to the following experimental programs:

Group I, on the first day, received instructions for the various conditions followed by two indoctrination trials under Condition A. Between the first and second indoctrination trials, the importance of maintaining a constant criterion was stressed. (Instructions are probably important

in this type experimentation; a previous report (8) includes a complete description of the instructions used in this experiment.) The indoctrination series was followed by four test trials, two Condition C trials separated by a 90 sec. rest interval and two Condition D trials separated by a 90 sec. rest interval. Half of the 10 Ss received Condition C first while the other half received Condition D first, but in either case the change in conditions was separated by a rest interval of 180 sec.

Twenty-four hours later the habituation series, described fully in a previous report (8), was commenced. It consisted of 39 trials in which Conditions A and B were regularly alternated, and was massed into one period of approximately 1.5 hours duration. Five minutes after this series, four test trials, composed of Conditions C and D, were given in the same order used before the habituation series.

The Group II experimental program differed from that of Group I in only one respect, viz., the habituation series was distributed over four, half-hour, daily sessions rather than being 'massed' into one period on one day.

POSTROTATIONAL RESULTS

The mean Condition C score (10 rpm score) and mean Condition D score (22 rpm score) for each subject before the habituation series, when compared respectively with the 10 and 22 rpm scores after the habituation series, reveal a substantial decrement for these 'unpracticed' angular velocities. That this is true for both groups is obvious in Fig. 1, and it is very improbable that these differences are attributable to chance (Table 1). Apparently habituation to rotation is not specific to the practiced angular velocity.

In order to compare the transfer of habituation to the 10 rpm trials with the transfer of habituation to the 22 rpm trials, the ratio of the total response decrement to the test scores obtained before the habituation series was computed for the 10 and 22 rpm trials and for each S. The per cent reduction was greater for 10 rpm trials than for 22 rpm trials in 19 of the 20 Ss in the two groups. The statistical treatment represented in Table 2 substantiates the apparent conclusion that the difference in per cent reduction between the 10 and 22 rpm trials, noticeable in Fig. 2, is not attributable to chance.

A similar conclusion is reached by comparing the absolute decrements for the two conditions. The overall mean decrement for the two groups with the 10 rpm trials was 9.97 sec. and the corresponding figure for the 22 rpm trials was 7.95 sec., a difference which is not attributable to chance ($t = 2.76$; $df = 19$; $P < .02$).

The fact that the per cent reduction is greater with the 10 rpm trials than with the 16 rpm trials (see Fig. 2) suggests that habituation to a given stimulus will produce even greater response reduction to stimuli of lesser intensity and less response reduction to stimuli of

greater intensity than is obtained with the intermediate stimulus itself. Because there were no 16 rpm test trials before and after the habituation series comparable to the 10 and 22 rpm test trials, it was necessary to use the ratio of the initial trial of the habituation series to the final trial of the habituation series as a basis for the computation of the per cent reduction scores with 16 rpm. Hence the initial and final 10 and 22 rpm test trials were separated by more trials than the initial and final 16 rpm trials used to estimate per cent reduction. That this factor would not vitiate the relationship shown in Fig. 2 is indicated by the fact that when the two indoctrination trials (Condition A), which occurred before either the initial 22 or 10 rpm test trials, are used in conjunction with the final Condition A trial of the habituation series as a basis for computing the 16 rpm per cent reduction, the outcome is substantially the same as before, 48.5% reduction in this case as compared with the 46.7% reduction formerly obtained. The slight increase in this value for 16 rpm does not alter the conclusion that habituation to a given intermediate stimulus will produce greater response reduction to stimuli of lesser intensity and conversely lesser response reduction to stimuli of greater intensity than is obtained with the intermediate stimulus.

ROTATIONAL RESULTS

Data obtained on the first effect of rotational OGI are substantially the same, with regard to habituation, as the postrotational data just presented. Absolute reductions and per cent reductions were greater for the 10 rpm trials than for the 22 rpm trials. The difference in absolute reduction ($t = 2.42$; $df = 19$; $p < 0.05$) and the difference in per cent reduction ($t = 4.69$; $df = 19$; $p < 0.001$) are both statistically reliable. Once again the response reduction for the 'unpracticed' 10 rpm trials was greater than that for the 16 rpm trials which constituted the habituation series and these in turn exhibited greater response reduction than was obtained with the 22 rpm trials.

The per cent reduction with the rotational effect was less than the per cent reduction with the postrotational effect. The 22 rpm data show 17.3% reduction and 37.3% reduction for the rotational and postrotational effects respectively. The 10 rpm data show 28.8% reduction and 52.7% reduction for the rotational and postrotational effects respectively. These differences between the rotational and postrotational effects are consistent with the inference presented in a previous report (8), viz. that the Condition B overhead light (used during the habituation series) had an habituatory effect which does not generalize to vestibular stimuli with opposite directional components.

COMPARISON OF THE 10, 16 AND 22 RPM TRIALS IRRESPECTIVE OF HABITUATION

Prior to the habituation series, both groups received identical treatment and the groups may be combined for purposes of comparing the 10, 16 and 22 rpm trials. In these comparisons, a single mean score based on the

two 10 rpm test trials and a single mean score based on the two 22 rpm test trials was computed for each S, and these are compared with the 16 rpm data which are the first trials of the habituation series for each S.

It is necessary to distinguish between response scores adjusted for the duration of the positive or negative acceleration periods and unadjusted response scores. For example, the mean duration of the postrotational effect with the 22 rpm trials was 21.6 sec. as compared with 19.4 sec. obtained with the 10 rpm test trials. It is highly unlikely that this difference is a result of chance ($t = 4.56$; $df = 19$; p .001). However these response durations were measured from the onset of the deceleratory stimulus, and the average deceleration time for 22 rpm trials was 2.3 sec. as compared with 1.0 sec. for the 10 rpm trials. Subtracting the respective deceleration times from the mean response durations leaves a mean difference between the two conditions of only 0.84 sec., a difference which is of questionable statistical reliability ($t = 1.78$; $df = 19$; $p < 0.10$, two-tailed test; $p < 0.05$, one-tailed test). In the following discussion, the term, adjusted response score, refers to response duration after the mean acceleratory or deceleratory times have been subtracted.

An F test (Table 3) was used to compare the postrotational adjusted response scores obtained before the habituation series for 10, 16 and 22 rpm. This test indicates that the mean response durations under these three conditions differ among themselves more than would be expected on the basis of chance. On the basis of t tests, however, one can infer that the important difference is between the 10 rpm trials ($M = 18.4$ sec.) and 16 rpm trials ($M = 20.0$ sec.) ($t = 2.33$; $df = 19$; $p < .05$), since the difference between the 16 and 22 rpm trials is readily attributable to chance, while, as indicated above, even the difference between 10 and 22 rpm trials is of questionable reliability.

After the habituation series, there are pronounced mean differences between the adjusted postrotational 10, 16 and 22 rpm trials which are not attributable to chance (Table 4). The 16 rpm data used in these analyses are the results of the last trials of the habituation series. In this case, all of the differences between the 10, 16 and 22 rpm trials are statistically reliable.

With the rotational data prior to the habituation series, there are only slight differences between the adjusted mean scores for the 10, 16 and 22 rpm trials and these are easily attributable to chance (Table 5). Following the habituation series, the rotational data reveal slight but significant differences for the three angular velocities (Table 6).

Although rotational and postrotational responses were reduced by the habituation series, the responses were indicative of more sensitivity to differences in stimuli after than before the habituation series.

Another notable aspect of the results is that the adjusted mean response durations for the $20^{\circ}/\text{sec.}^2$ angular acceleration are as long as the respective 10, 16, and 22 rpm trial values for the $60^{\circ}/\text{sec.}^2$ angular acceleration before habituation (Fig. 3). Mulder (13) suggested that the

product of the time and the acceleration required to reach the threshold of rotational sensation is a constant. If this were generalized to mean that, above threshold, equal vestibular stimuli are produced by keeping this product constant, then the magnitude of angular velocity would be the critical aspect of the rotational stimulus, since the product of angular acceleration and time equals angular velocity. Although this is not refuted by comparisons within any one angular velocity before habituation in the present study, the inverse relationship between retardation rate and duration of postrotational nystagmus with a constant angular velocity reported by Dunlap & Dorcus (5) is inconsistent with this generalization. The following analysis indicates an explanation which is consistent with both of these experiments.

Let us assume that slight differences in magnitude of angular accelerations with the three conditions, C (10 rpm), A (16 rpm) and D (22 rpm), are negligible. Then the rotational data represent response durations with an angular acceleration of approximately $20^{\circ}/\text{sec.}^2$ applied for 3.0, 5.0 and 6.5 sec. durations, and the postrotational data represent response durations with an angular acceleration of approximately $60^{\circ}/\text{sec.}^2$ applied for 1.0, 1.5 and 2.3 sec. duration. With a given angular acceleration, theoretically there is a particular duration of angular acceleration which will produce a maximum cupula deviation for that angular acceleration. Assume a direct relationship between duration of the vestibular response, time of cupula return and degree of cupula deviation produced by the stimulus. Then beyond this hypothetical duration, the adjusted response would not be increased in duration by increments in duration of the angular acceleration, and the unadjusted response, i.e., the total response from the onset of angular acceleration to the end of the response, would be increased only by the amount which this theoretical acceleration duration is exceeded. With durations of angular acceleration less than this critical duration, the adjusted response should show increments in response duration with increments in duration of the angular acceleration. Furthermore there should be an inverse relationship between the magnitude of this critical stimulus duration and the magnitude of the particular angular acceleration used. Hence in comparing the response duration curves produced by $20^{\circ}/\text{sec.}^2$ and $60^{\circ}/\text{sec.}^2$ angular accelerations applied for various durations, it is to be expected that the $60^{\circ}/\text{sec.}^2$ curve would rise more suddenly and attain its maximum level with lesser durations of angular acceleration than would the $20^{\circ}/\text{sec.}^2$ curve. This is represented in Fig. 4 where the points available from the present experiment are plotted. These points are based on data collected before the habituation series. It should be emphasized that the curves between the origin and the first observed points are interpolations, i.e., the gradual slope with $20^{\circ}/\text{sec.}^2$ (gradual relative to the $60^{\circ}/\text{sec.}^2$ slope) is theoretical rather than observed.

The data following the habituation series (Fig. 5) present a different picture than the data obtained before the habituation series (Fig. 4) for two reasons: (1) The 10, 16 and 22 rpm trials were differentially influenced by the habituation series. (2) The postrotational effects, irrespective of the three angular velocities employed, were more influenced by habituation, presumably due to the Condition B postrotational visual

stimulation, than the rotational effects (Fig. 3). In other words, the points in the 60°/sec.^{2} curve (postrotational data) in Fig. 5 were more influenced by habituation than the points in the 20°/sec.^{2} curve (rotational) and, of course, if it were not for this differential habituation, Figs. 4 and 5 would be very similar.

A note of caution is offered with respect to the above comparisons. The positive and negative angular accelerations mentioned are average angular acceleration, i.e., the rate of change of angular velocity with respect to time is not constant throughout the duration of the angular acceleration. Furthermore the durations of these angular accelerations for the three conditions are mean durations with standard deviations within conditions of 0.15 sec. or less as estimated from calibration trials. It is suspected that more precise control of the vestibular stimulus would only make the trends in the above results more clear-cut by reducing response variability. Because the availability of much more precise apparatus for controlling vestibular stimuli is anticipated, it may be possible to check this suspicion experimentally. The assumption that the differences in magnitudes of the average angular accelerations, eg., 60°/sec.^{2}, 64.0°/sec.^{2} and 57.4°/sec.^{2}, are negligible is also an assumption which can only be checked when more precise equipment is available.

DISCUSSION

The habituation of postrotational nystagmus has been classified by Razran (14) as an example of "extinction-like manifestations in non-conditioned responses." He indicates that two characteristics of "extinction-like" phenomena are: (1) more decrement with weaker than with stronger stimuli, and (2) spread of decrement to similar stimuli. These two characteristics suggest that habituation to a given vestibular stimulus should transfer less readily to strong vestibular stimuli than to weak vestibular stimuli. The present results seem to support this inference. However, the process by which response durations with the various stimuli employed became differentiated during the habituation series is not understood.

Aside from this, the results are curious in that 3.0 sec., 5.0 sec. and 6.5 sec. applications of a 20°/sec.^{2} angular acceleration did not produce adjusted responses of different durations before habituation. This was also true of the 60°/sec.^{2} angular acceleration applied for 1.5 sec. and 2.3 sec. If the different durations of angular acceleration are really equivalent to different stimulus intensities, then why did the response durations prior to habituation fail to reflect changes in the stimulus? This question of course has many conceivable answers. It should be pointed out however that changes in stimulus intensity are not always reflected by changes in response duration even within a range of stimulus intensities which produce changes in other aspects of the vestibular response. Buys (1) attempted to keep duration of angular acceleration constant (1.5 sec.) while employing a range of average angular accelerations from 12°/sec.^{2} to 240°/sec.^{2}. The results indicated that the intensity of normal nystagmus was directly proportional to the

angular acceleration whereas the duration of normal nystagmus seemed in direct relation to angular velocity only at the lower velocities investigated. Similar results have been reported by Wendt (15). Buys' finding, that beyond a certain point duration of response failed to increase while the intensity of response continued to increase with increments in angular accelerations, demonstrates the importance of attempting to specify the cupular correlates of intensity as well as duration of response. This matter will be more carefully considered in a subsequent report.

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Table 1

Comparison of Test Trials Before and After the Habituation Series by t Tests for Related Measures

Group	RPM	Before	After	df	t	P
I	22	20.16	13.13	9	4.65	0.01
	10	18.31	9.65	9	6.89	0.001
II	22	22.98	14.10	9	10.38	0.001
	10	20.55	9.26	9	13.85	0.001

Table 2

Reliability of Difference in Transfer of Habituation to 10 RPM and 22 RPM Test Trials

Group	10 RPM	22 RPM	df	t	P
I	49.24	34.85	9	2.87	0.02
II	56.08	39.69	9	5.89	0.001

Table 3

Variance Analyses of Results Obtained Before the Habituation Series with Rotation Velocities of 10, 16 and 22 RPM (Average deceleration times were subtracted from the data)

Source	Sum of Squares	df	Mean Square	F
Between Conditions	23.466	2	11.73	3.94
Between Ss	1746.310	19	91.91	30.84
Remainder	113.288	38	2.98	
Total	1883.064	59		

Table 4

Variance Analyses of Results Obtained After the Habituation Series with Rotation Velocities of 10, 16 and 22 RPM (Average deceleration times were subtracted from the data)

Group		Sum of Squares	df	Mean Square	F
I	Between Conditions	24.20	2	12.10	5.19
	Between Ss	908.51	9	100.93	43.32
	Remainder	41.95	18	2.33	
	Total	974.66	29		
II	Between Conditions	61.72	2	30.86	14.63
	Between Ss	476.86	9	52.98	25.11
	Remainder	38.05	18	2.11	
	Total	576.63	29		

Table 5

Variance Analyses of Rotational Results Obtained Before the Habituation Series with Rotation Velocities of 10, 16 and 22 RPM (Average positive angular acceleration times were subtracted from these data)

Source	Sum of Squares	df	Mean Square	F
Between Conditions	5.346	2	2.67	0.4
Between Ss	1927.456	19	101.44	16.8
Remainder	229.608	38	6.04	
Total	2162.410	59		

Table 6

Variance Analyses of Rotational Results Obtained After the Habituation Series with Rotation Velocities of 10, 16 and 22 RPM (Average positive angular acceleration times were subtracted from these data)

Group		Sum of Squares	df	Mean Square	F
I	Between Conditions	36.017	2	18.01	3.74
	Between Ss	1616.312	9	179.59	37.34
	Remainder	86.630	18	4.81	
	Total	1738.959	29		
II	Between Conditions	12.352	2	6.18	3.57
	Between Ss	691.415	9	76.82	44.40
	Remainder	31.228	18	1.73	
	Total	734.995	29		

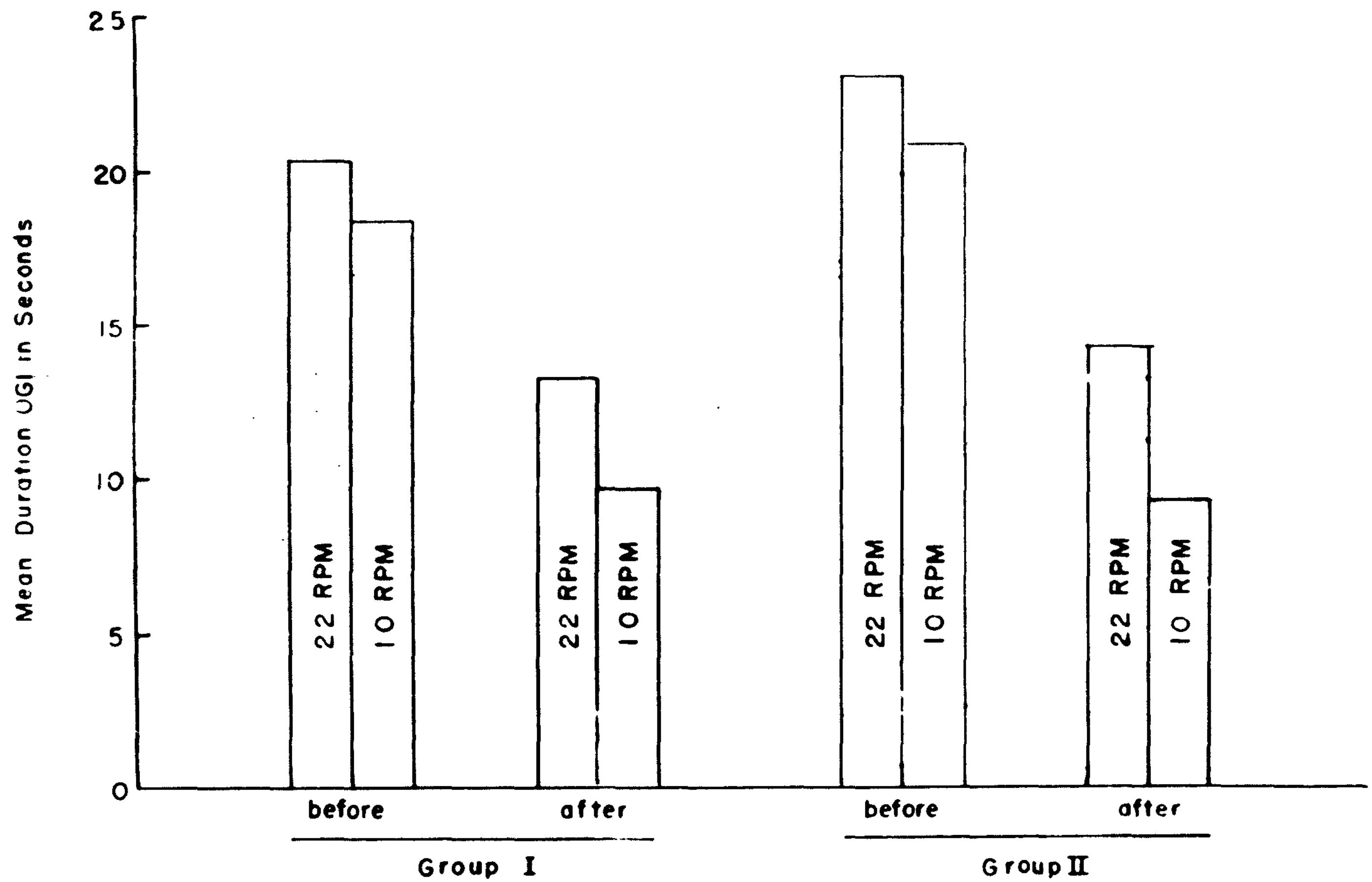

FIG. 1 TRANSFER OF HABITUATION AS REVEALED BY COMPARING RESULTS OF "UNPRACTI
ANGULAR VELOCITIES BEFORE AND AFTER THE HABITUATION SERIES.

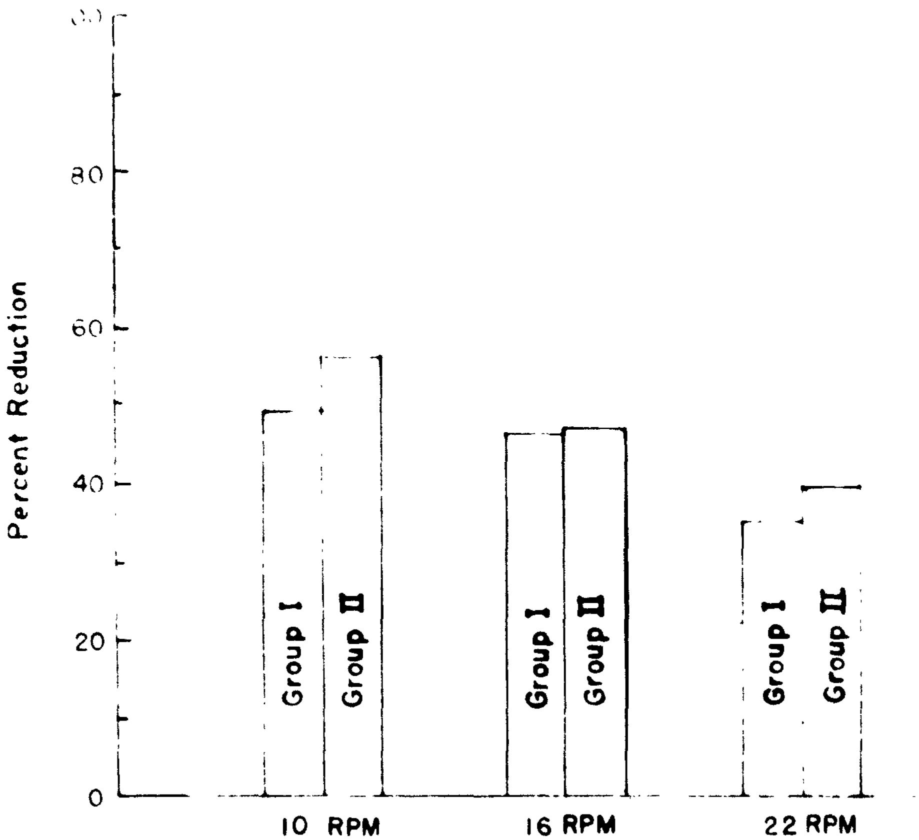

FIG. 2 PERCENT REDUCTION OF OGI RESPONSE FOR THREE ANGULAR VELOCITIES, TWO "UNPRACTICED" AND ONE "PRACTICED". NOTE THAT THE PERCENT REDUCTION FOR 10 RPM IS GREATER THAN THAT OF THE "PRACTICED" ANGULAR VELOCITY (16 RPM)

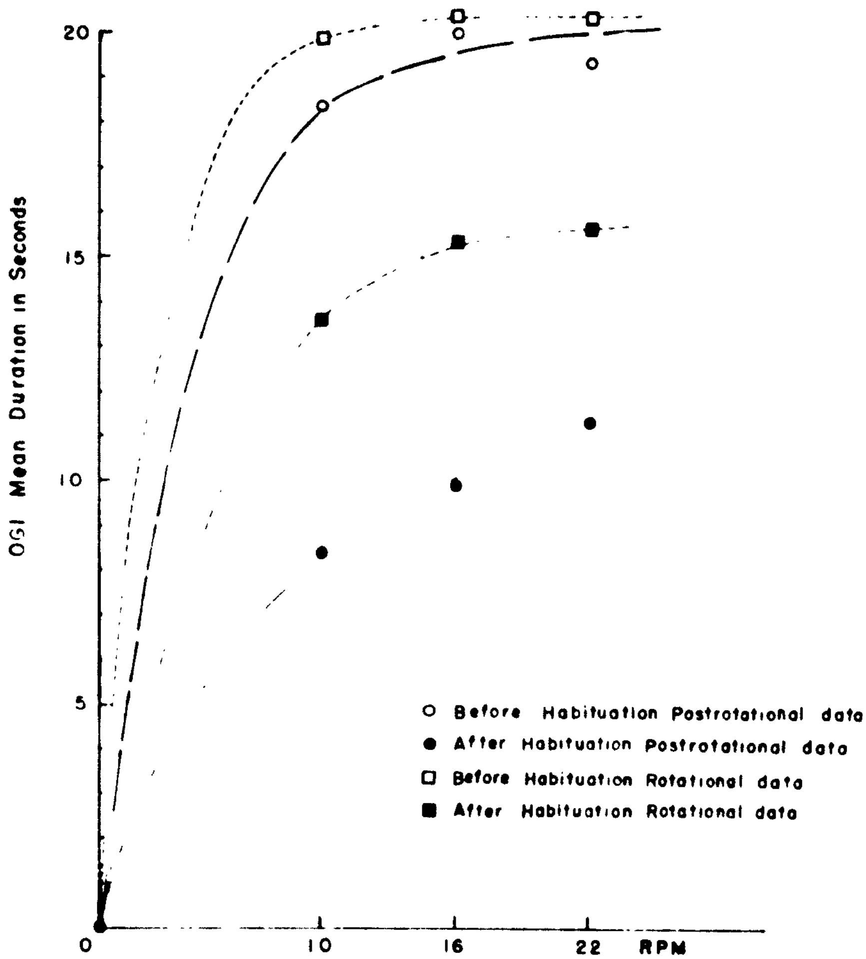

FIG. 3. COMPARISON OF 10, 16, AND 22 RPM TRIALS BEFORE THE HABITUATION SERIES AND ALSO AFTER THE HABITUATION SERIES. GROUPS I AND II WERE COMBINED. ROTATIONAL DATA WERE ADJUSTED FOR POSITIVE ANGULAR ACCELERATION TIMES AND POSTROTATIONAL DATA WERE ADJUSTED FOR NEGATIVE ANGULAR ACCELERATION TIMES.

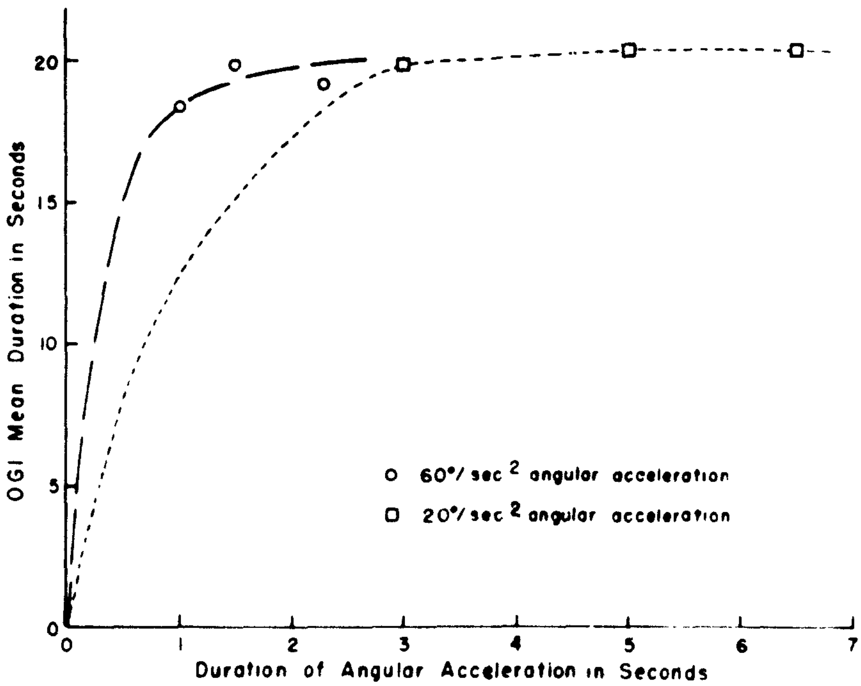

FIG. 4. COMPARISON OF ADJUSTED RESPONSES PRODUCED BY TWO ANGULAR ACCELERATIONS APPLIED FOR DIFFERENT DURATIONS BEFORE THE HABITUATION SERIES.

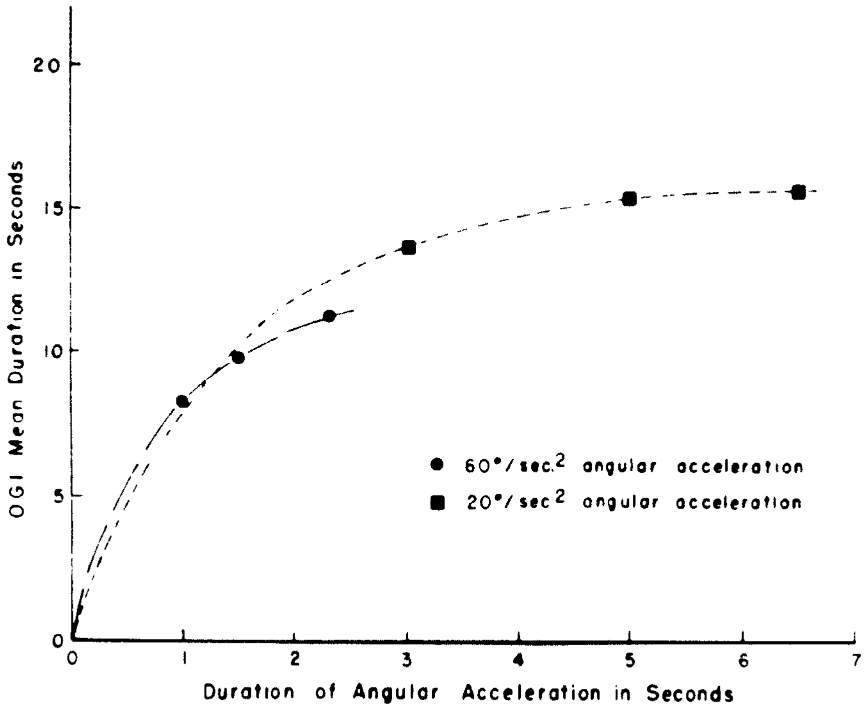

FIG. 5 COMPARISON OF ADJUSTED RESPONSES PRODUCED BY TWO ANGULAR ACCELERATIONS APPLIED FOR DIFFERENT DURATIONS AFTER THE HABITUATION SERIES. DIFFERENTIAL HABITUATION OF THE ROTATIONAL RESPONSES ($20°/sec.^2$ CURVE) AND POSTROTATIONAL RESPONSES ($60°/sec.^2$ CURVE) DISTORTS THE COMPARISON OF THESE TWO CURVES.

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THE TRANSFER OF HABITUATION TO ROTATION WITH RESPECT TO THE MAGNITUDE OF THE VESTIBULAR STIMULUS

Fred E. Guedry, Jr., Tulane University Project USN School of Aviation Medicine Naval Air Station, Pensacola, Florida

19 pp. 6 tables, 5 figures 27 cm. UNCLASSIFIED

This experiment is a study of the transfer of habituation with regard to the magnitude of the vestibular stimulus. Twenty human subjects received tests of the duration of the oculogyral illusion under two angular velocities before and after a series of 39 rotation trials in which an intermediate angular velocity was employed. The following inferences were made from the results. (1) Habituation is not specific to the 'practiced' angular velocity. (2) Habituation to a given intermediate stimulus will produce greater response reduction to stimuli of lesser magnitude and lesser response reduction to stimuli of greater magnitude than is obtained with the intermediate stimulus. This means that although the responses are reduced by the habituation series, the responses are indicative of a greater sensitivity to differences in vestibular stimuli after than before the habituation series. (3) Comparisons of the results prior to the habituation series have implications for theories of the vestibular end-organ which are discussed briefly. (4) Comparison of the rotational and postrotational results suggests that visual stimulation such as that produced by full room illumination has an habituatory effect which does not generalize to vestibular stimuli with opposite directional components.

1. Perception 2. Apparent Motion 3. Rotation 4. Habituation
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